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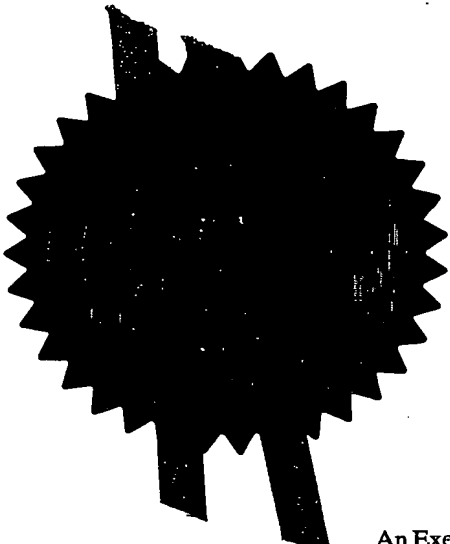
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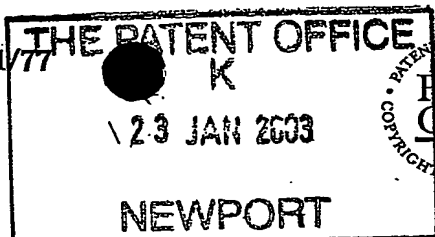


Signed

Stephen Hardley

Dated 28 October 2003

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Your reference

SC091-UK

2. Patent application number

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3. Full name, address and postcode of the or of each applicant (underline all surnames)

Varco I/P, Inc.
2835 Holmes Road
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770512
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Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

8408601007 Delaware, USA A/L-7/20

4. Title of the invention

Vibratory Separator and Screen Assembly

5. Name of your agent (if you have one)

LUCAS, Brian Ronald

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6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country	Priority application number (if you know it)	Date of filing (day / month / year)
UK	02 24156.0	17 Oct 2002

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing (day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
 - b) there is an inventor who is not named as an applicant, or
 - c) any named applicant is a corporate body.
- See note (d))

Yes

VIBRATORY SEPARATOR AND SCREEN ASSEMBLY

The present invention relates to an apparatus comprising a vibratory separator and a screen assembly. The invention also relates to a vibratory separator and a screen assembly for the apparatus. The invention also relates to a method for fitting a screen assembly into a vibratory separator.

In the drilling of a borehole in the construction of an oil or gas well, a drill bit is arranged on the end of a drill string and is rotated to bore the borehole. A drilling fluid known as "drilling mud" is pumped through the drill string to the drill bit to lubricate the drill bit. The drilling mud is also used to carry the cuttings produced by the drill bit and other solids to the surface through an annulus formed between the drill string and the borehole. The drilling mud contains expensive synthetic oil-based lubricants and it is normal therefore to recover and re-use the used drilling mud, but this requires the solids to be removed from the drilling mud. This is achieved by processing the drilling fluid. The first part of the process is to separate the solids from the solids laden drilling mud. This is at least partly achieved with a vibratory separator, such as those shale shakers disclosed in US 5,265,730, WO 96/33792 and WO 98/16328.

Shale shakers generally comprise an open bottomed basket having one open discharge end and a solid walled feed end. A number of rectangular screens are arranged in the basket, which are held in C-channel rails located on the basket walls, such as those disclosed in GB-A-2,176,424. The basket is arranged on springs above a receptor for receiving recovered drilling mud. A skip or ditch is provided beneath the open discharge end of the basket. A motor is fixed to the basket, which has a drive rotor provided with an offset clump weight. In use, the

disclosed in PCT Publication No. WO 01/76719, which discloses, amongst other things, a flat panel like portion having apertures therein and wing portions which are folded to form a support structure, which may be made from a single sheet of material. This rigid support has been assigned the Trade Mark "UNIBODY" by the applicants.

The layers of mesh in the screens wears out frequently and therefore needs to be easily replaceable. Shale shakers are generally in the order of 5ft wide and 10ft long. A screen of dimensions 4ft wide by 10ft long is difficult to handle, replace and transport. It is known to use two, three, four or more screens in a single shale shaker. A standard size of screen currently used is of the order of 4ft by 3ft.

US-A-4,582,597 discloses a vibratory separator having a basket and channels arranged on internal faces of the basket for receiving the two sides of a screen assembly. An inflatable hose is arranged in the channels. The screen assembly comprises screening mesh laid over and fixed to a frame. The screen assembly is slid into the channels in the vibratory separator. The hose is inflated using a pneumatic fluid to force the frame of the screen assembly to assume a crowned centre, in order to reduce whipping.

GB-A-2,176,424 discloses a vibratory separator having a basket and channels arranged on internal faces of the basket for receiving a screen assembly and a clamping device. The screen assembly comprises screening mesh laid over and fixed to a frame. The clamping device comprises a frame of similar dimensions to the frame of the screen assembly. The frame has an inflatable stocking thereon, which is attached to pneumatic or hydraulic fluid supply means. When both the screen assembly and the clamping device are slid into the channels, the stocking is inflated to fix the screen assembly in the channels.

a basket, a side rail for fixing at least a portion of a periphery of the screen assembly to the basket, and means arranged within the periphery of the screen assembly for fixing the screen assembly to the basket, wherein the
5 screen assembly comprises screening material and a rigid support, characterised in that the means deflects the screen assembly upon fitting of the screen assembly in the vibratory separator. Preferably, the screening material is fixed to the rigid support and wherein the
10 rigid support substantially prevents screening material from curling. Advantageously, the screening material is tensioned over the rigid support and wherein the rigid support does not distort or bend under the tension. Preferably, the rigid support inhibits or prevents the
15 screen assembly from bowing when the screen assembly is held at its periphery. Advantageously, the rigid support inhibits the screen assembly from flexing.

Preferably, the deflection tightens the screening material. Advantageously, the deflection reduces movement
20 of the screen assembly when the vibratory separator vibrates the screen assembly. Preferably, the deflection is between 1mm and 30mm, advantageously between 2mm and 6mm and most preferably the deflection is between 2mm and 3mm. Preferably, the deflection does not crown the screen
25 assembly, although it is a sufficient deflection to add rigidity to the screen assembly. Crowning of the screen may cause shale being separated to tram line along the sides of the screen assembly, which reduces effective screening area. A screen assembly having a slight
30 deflection will mitigate this problem, whilst increasing the rigidity by reducing the span and retaining the full screening area of the screen assembly.

Advantageously, the means comprises a rail on the screen assembly engageable with a rail in the vibratory
35 separator. Preferably, one of the rails comprises a T-

side rail. The side rail may be arranged on an inside wall(s) of the basket. In a rectangular shaker, the side rails may be arranged on each side and perhaps one or two end walls and they may be arranged horizontally within the basket, or at an angle of up to 10° and preferably 7° to the horizontal.

The invention also provides a vibratory separator of the apparatus of the invention, the vibratory separator having means to deflect a screen assembly

The invention also provides a screen assembly for a vibratory separator, the screen assembly comprising a rigid support and screening material, wherein the screen assembly has a periphery characterised in that the support further comprises a fitting within the periphery for receiving a means for deflecting the rigid support in the vibratory separator.

The invention also provides a method for fitting a screen assembly in a vibratory separator, the screen assembly having a perimeter and comprising a support having screening material arranged thereon, the method comprising the steps of inserting the screen assembly into a vibratory separator, clamping the screen assembly in at least the side rails, wherein at least part of the screen assembly within its perimeter is deflected over a means arranged within the perimeter of the screen assembly to fix the screen assembly in the vibratory separator. Preferably, the means is movable in a vertical direction to deflect the screen assembly.

shale shaker in accordance with the present invention, the shale shaker having side clamping rails and a central clamp;

5 Figure 3A is a rear end view of the shale shaker and screen assembly shown in Figure 3;

 Figure 3B is a rear end view of part of the central clamp shown in Figure 3;

 Figure 3C is a side view of the part of the central clamp shown in Figure 3;

10 Figure 3D is a view in cross-section of the part of the central clamp taken along line 3D-3D of Figure 3C;

 Figure 3E is a top view of the part of the central clamp of Figure 3B;

15 Figure 3F is a top plan view of the screen assembly shown in Figure 3, with a portion of screening material cutaway;

 Figure 3G is a perspective view of the rear end and underneath of the screen assembly shown in Figure 3;

20 Figure 3H is a side view of the screen assembly shown in Figure 3;

 Figure 3I is a view in cross-section taken along line 3I-3I of Figure 3F;

 Figure 3J is a view in cross-section taken along line 3J-3J of Figure 3F;

25 Figure 3K is a rear end view of the screen assembly shown in Figure 3;

30 Figure 3L is a rear end view of the screen assembly shown in Figure 3, arranged in the side clamping rails and the central clamp of the shale shaker of Figure 3, the central clamp deactivated;

 Figure 3M is a rear end view of the screen assembly shown in Figure 3, arranged in the side clamping rails and the central clamp of the shale shaker of Figure 3, the central clamp activated;

35 Figure 4 is a scrap rear end view of a part of a

the basket end. Typically the basket will be in a "climb the hill" position so that a pool of liquid is maintained at one end within the basket.

Referring to Figure 2, there is shown a screen assembly, generally identified by reference numeral 100. The screen assembly 100 comprises a panel 101, a support structure 102 and a pull down member 103. In use, the panel 101 would have at least one layer of screening material adhered or otherwise attached thereto. Typically, each layer of screening material comprises a layer of wire mesh. Typically, the panel 101 would have three layers of wire mesh lying one over the other, the lowermost layer of wire mesh having larger openings and larger wires. In use, the screen assembly 100 is arranged in clamping rails 104 and 105 of a shale shaker.

Referring to Figures 2A, 2D and 2G, the panel 101 is made from a 1.5mm mild steel plate. The panel 101 comprises an area 106 provided with a plurality of apertures, a left side portion 107 provided with no apertures and a right side portion 108 provided with no apertures. The plurality of apertures in area 106 comprises a plurality of triangular apertures and a plurality of circular openings.

The panel 101 is formed from a blank shown in Figure 1H. Lines 110 and 111 and fold lines 112 and 113 indicate the boundary of area 106 which will be provided with the plurality of apertures. The area 106, the left side portion 107 and right side portion 108, all lie in the same plane to form a flat top surface. Left side portion 107 and right side portion 108 extend the entire length of the panel 101. Wing portions 114 and 115 approximately 1cm wide extend the entire length of the panel 101. The wing portions 114 and 115 are folded downwardly to stand approximately at right angles to the top surface. The forward end of the panel 101 has a forward end portion

areas 135, 136 and 137 of panel 101 bounding the semi circular ends 121, 122 and 123 are also folded downwardly.

Referring back to Figures 1D and 1G, triangular apertures, such as triangular aperture 118, are arranged in ten full sets of rows in the panel 101 and one further row of a set. A first set 138 comprises a first row 139 having a rearwardly pointing triangular aperture 118 and a forwardly pointing triangular aperture 140 adjacent thereto, such that folded structural portion 132 and a folded structural portion 141 of the forwardly pointing triangular aperture 140 form a panel rib 142, approximately 2.3mm wide. An apex 143 of the forwardly pointing triangular aperture 140 is rearwardly offset by approximately 2.3mm?? from a base edge 131a of the rearwardly pointing triangular aperture 118. The first row 139 comprises twelve forwardly pointing triangular apertures interspaced by twelve rearwardly pointing triangular apertures. The first set 138 also comprises a second row 144, which is a mirror image of the first row 139 about line A-A. A structural portion 145 of forwardly pointing triangular aperture 140 of the first row 139 and a structural portion 146 of a rearwardly pointing triangular aperture 147 of the second row 144, form a panel rib 148. The underside of panel rib 148, the structural portion 145 and the structural portion 146 form a channel. The panel rib 148 is in line with panel ribs 149 to 159 in the first set 138, the undersides of which form a channel which extends the width of the panel 101. Circular opening 119 is drilled, punched, laser cut or otherwise formed in the panel 101 between vertices 125, 160, 161 and 162 of rearward pointing triangular aperture 118, forward pointing triangular aperture 163, forward pointing triangular aperture 140 and rearward pointing triangular aperture 147 respectively. A segment

screen assembly 100. Two receiving rails 198 and 199 are welded in respective recesses 200 and 201 in the body portion 190, intermediate the rib 178, preferably, each located at a third of the length of the rib from either end thereof. The receiving rails 198 and 199 are of a C-shape cross-section to receive the inverted T-rails 176 and 177. The eleven other ribs 179 to 189 have corresponding heads, which are welded at intervals therealong to the left side runner 196 and right side runner 197 respectively and corresponding recesses in which receiving rails 198 and 199 are welded. The rib 178 is at a rear end; rib 179 is arranged slightly less than two intervals from rib 178; rib 180 is arranged two intervals from rib 179; rib 181 is arranged two intervals from rib 180; rib 182 is arranged two intervals from rib 181; rib 183 is arranged two intervals from rib 182; rib 184 is arranged two intervals from rib 183; rib 185 is arranged two intervals from rib 184; rib 186 is arranged two intervals from rib 185; rib 187 is arranged two intervals from rib 186; rib 188 is arranged two intervals from rib 187; rib 189 is arranged slightly less than one interval from rib 187. An interval being equal to the width of a row 139, 144 in the panel 101; and two intervals being equal to the width of a set of rows 138 in the panel 101.

Referring to Figures 2, 2C and 2F the support structure 102 comprises twelve substantially identical support ribs 202 to 213. Support rib 202 is made from 3mm steel plate. The support rib 202 has a body portion 214, a left arm 215 extending from the body portion having a bottom face 216, and a right arm 217 having a bottom face 218. A left side support bar 219 is welded in recess 220 in the left side of the body portion 214 and a right side support bar 221 is welded in recess 222 in a right side of the body portion 214. The left side support bar 219

interval from support rib 204; Rib 180 is arranged one interval from support rib 204 and one interval from support rib 205; rib 181 is arranged one interval from support rib 205 and one interval from support rib 206; 5 rib 182 is arranged one interval from support rib 206 and one interval from support rib 207; rib 183 is arranged one interval from support rib 207 and one interval from support rib 208; rib 184 is arranged one interval from support rib 208 and one interval from support rib 209; 10 rib 185 is arranged one interval from support rib 209 and one interval from support rib 210; rib 186 is arranged one interval from support rib 210 and one interval from support rib 211; rib 187 is arranged one interval from support rib 211 and one interval from support rib 212; 15 rib 188 is arranged one interval from support rib 212 and one interval from support rib 213 and slightly less than one interval from rib 189. The support ribs 203 to 212 align underneath the lines of panel ribs 226 to 235 between structural portions folded to form the edge of the apertures. Support rib 202 aligns with line of panel 20 ribs 236 and support rib 213 aligns with line of panel ribs 237.

The panel 101 has at least one layer screening mesh arranged thereon. The layer of screening mesh may be 25 tensioned and adhered to the outer perimeter of the panel 101 and to all of the panel ribs. Preferably, at least three layers are applied. The layers may be of the same mesh grade or of different mesh grades. Preferably, a layer of screening mesh having larger openings and larger 30 wires lies beneath layers of fine mesh.

In use, the screen assembly 100 has layers of mesh (not shown) arranged on the panel, and is slid into clamping rails 104 and 105 of a shale shaker. The clamping rails 104 and 105 comprise a C-shape rail 240 35 and 241 having a bottom surface 242 and 243 on which the

rails 104 and 105. The panel 101 having layers of worn out screening mesh thereon and the pull down member 103 may be lifted from frictional engagement with the support structure 102. The panel 101 is slid out from receiving rails 198 and 199 and replaced with a new panel having layers screen mesh thereon. The rails of the new panel are slid into the receiving rails of the pull down member 103. The pull down member 103 with the new panel is placed on the original support structure 102 and slid back into the shale shaker.

It is envisaged that the panel may be of any known type, such as 1.5mm to 3mm steel, aluminium or plastics material plate with a multiplicity of apertures punched therein or perforated plate, not having folded edges to the apertures. The apertures may be oblong, pentagonal, hexagonal, heptagonal, octagonal, circular or any other shape.

The layers of screening material used in any of the embodiments shown herein and in any embodiment of the invention, may be pre-tensioned and adhered, bonded or otherwise attached to the panel. The layer of mesh may be bonded using a heat activated powder.

Referring to Figures 3 and 3A, there is shown a screen assembly 400 arranged in a shale shaker 300. The shale shaker 300 comprises a basket 301 having solid walled sides 302 and 303 and an open bottom 304. C-shape rails 305 and 306 are located on the inside of solid walled sides 302 and 303 respectively. The C-shape rails 302 and 303 may be welded or otherwise attached or formed integrally with the solid walled sides 302 and 303. The C-shape rails may be arranged parallel with the top and bottom of the basket, or may be arranged at an angle thereto, such that the screen assemblies arranged in the C-shape rails 305 and 306 lie at an incline from the feed end to the mouth of the basket. This incline may be

(may be up to 10mm, but preferably no more than 5mm). A plate 320 extends substantially the entire length of the housing 314 within the housing 314. The plate 320 has opposing sides 321 and 322. Each side 321 and 322 is
5 castellated (only two shown 321a and 322a). The tops of the castellations 321a, 322a on each side 321 and 322 are welded to the sidewalls 315 and 316 respectively, to form spaces (only two shown 321b and 322b) between adjacent castellations.

10 An inner housing 323 is arranged in the housing 314 and extends upwardly through the slot 319. Parts of the inner housing 323 are shown in Figures 3B to 3E. The inner housing 323 comprises a bottom plate 324, a body 325, a neck 326 and a top 327. The body 325 comprises a
15 top plate 328 and two side plates 329 and 330. The side plates 329 and 330 may be welded to the top plate 328 or formed integrally with the top plate 328. The side plates 329 and 330 have castellations 331 and recesses 332 therebetween, as shown in Figure 3C. The bottom plate
20 extends substantially the entire length of the housing 314 and is welded to the castellations 331. The neck 326 extends from the centre of the top plate 328 and has a top 327 arranged thereon to form a T-bar. The top 327 may be welded or formed integrally with the neck and the neck
25 may be welded or formed integrally with the top plate 328. The neck 326 has a portion 333 located near an end 334 of the top plate 328 which is not provided with a top and is chamfered. There is a ledge 335 provided at the end 334. The top 327 extends from the top of the
30 chamfered portion 331 to a rear end 336 of the top plate 328. The top 327 is provided with an arrow head portion 335. The body 325 has an opening 337 for receiving a hose 338.

Referring back to Figure 3, the castellations 331 in
35 the body 325 of the inner housing 323 are vertically

and 407. Each rib 414 takes the form of a "lazy 7", which increases its rigidity. It is an aspect of the invention to have a screen assembly comprising at least one rib which is formed in the shape of a lazy 7 to increase the rigidity of the screen assembly. The ribs 414 may be arranged along solid parts of the panel 401, so that the apertures 402 are not obscured.

A rail 416 is arranged along a central line of the screen assembly 400 in central recesses 415 in the ribs 414 and the strips of steel 410 and 412. The rail 416 is welded to the ribs 414 and strips of steel 410 and 412. The rail 416 is of uniform section and extends the entire length of the screen assembly 400. The rail 416 comprises a top 417, sides 418 and 419, each side having an inwardly and upwardly turning part forming a slot 420 and two shoulders 421 and 422. The shoulders 421 and 422 are flush with the bottoms of the ribs 414 and the steel strips 410 and 412. It should be noted that, it is preferred that the top 417 of the rail 416 is spaced from the panel 401, such that, in use, material filtered through the layers of screening material 404 and the apertures 405 in the panel 401 is substantially unobstructed and passes around the rail 416 and into a sump therebeneath.

Referring now to Figures 3L and 3M, in use, the front end of the slot 420 of the rail 416 of the screen assembly 400 is located over the chamfered neck 333 of the central clamp 311 and the sides 406 and 407 of the screen assembly 400 are located in the C-shape rails 306 and 307. The screen assembly 400 is slid on to the T-bar 326, 327 and into the C-shape rails 305 and 306 until the front of the screen assembly 411 abuts a preceding screen assembly or the end fitting of the shale shaker 400. A second, third, fourth and fifth screen assembly may be slid into the shale shaker 300 behind the first screen

steel 503 (and not shown). The rail 501 is of uniform section and extends the entire length of the screen assembly 500. The rail 501 comprises a top 504, sides 505 and 506, one side having an inwardly and upwardly turning part 507 which is along the central line of the screen assembly, forming a hook a shoulder. The shoulder is flush with the bottoms of the ribs and the steel strips 503. It should be noted that, it is preferred that the top 504 of the rail 501 is spaced from an apertured panel 508, such that, in use, material filtered through the layers of screening material (not shown) and the apertured panel 508 is substantially unobstructed and passes around the rail 501 and into a sump therebeneath. A hook rail 509 of the central clamp, is shown engaged with the rail 501 for pulling the rail 501 and hence a central part of the screen assembly down to fix the screen assembly in place in the vibratory separator.

Figure 5 shows an alternative shale shaker for of the screen assembly 600. The screen assembly 600 is identical to the screen assembly shown in Figure 3. The shale shaker has an alternative central clamp (not shown in full). A rail 601 is arranged along a central line of the screen assembly 600 in central recesses 602 in ribs (not shown) and the strips of steel 603 and (not shown). The rail 601 is welded to the ribs and strips of steel 603 and (not shown). The rail 601 is of uniform section and extends the entire length of the screen assembly 600. The rail 601 comprises a top 604, sides 605 and 606, each side having an inwardly and upwardly turning part 607 and 608 forming two shoulders and a slot 609. The shoulders 607 and 608 are flush with the bottoms of the ribs and the steel strips 603. It should be noted that, it is preferred that the top 604 of the rail 601 is spaced from an apertured panel 610 arranged on the ribs and steel strips 603, such that, in use, material filtered through

the screen assembly 700 is evenly balanced, the sides 703 and 704 lie 2-3mm above top surfaces 811 and 812 of bottom members 813 and 814 of the clamping rails 801 and 802 of the shale shaker 800. In use, pneumatic bladders 815 and 816 arranged in the clamping rails 801 and 802 are inflated, which pushes the sides 703 and 704 on to the top surfaces 811 and 812 of the bottom members 813 and 814 of the clamping rails 801 and 802. A tonne of force is applied to the inflatable bladders. The screen assembly 700 is rigidly secured in the clamping rails 801 and 802 and over the central T-rail 803. The screen assembly is deflected over the central T-rail 803.

Figure 7A discloses a screen assembly 900, which is identical to the screen assembly shown in Figure 3, arranged in clamping rails 1001 and 1002 of a shale shaker 1000.

The shale shaker 1000 is identical to the shale shaker shown with reference to Figure 3, save for the central clamp. Instead of the central clamp there is a T-bar 1003 running the length of the shale shaker 1000. The T-bar rail 1003 comprises a steel top plate 1004 welded to a vertical plate 1005. The bottom of the vertical plate 1005 is welded to a n-section girder 1006. The n-section girder comprises a top plate 1007 and two sides 1008 and 1009. The top plate 1007 of the n-section girder 1006 rests on upwardly extending side plates 1010 and 1011 of a u-section girder 1012. The u-section girder 1012 is welded at a lower end to rigid steel tubes (not shown) arranged between walls 1013 and 1014 of a basket 1015 of the shale shaker 1000. The n-section girder 1006 is vertically slideable on the u-section girder 1012. The n-section girder 1006 and the u-section girder 1012 define a cavity in which a pneumatic hose 1020 is arranged. The top plate 1004 of the T-bar 1003 has a top surface which is arranged at a height, such that a part

structure remains in the vibratory separator.

It is envisaged that the basket, solid steel plates and rigid steel tubes could be made from any other suitable material, such as aluminium, carbon fibre, steel.

It is envisaged that the bladders may be inflated with a hydraulic fluid or a part pneumatic, part hydraulic system. It is also envisaged that the C-shape rail 307 and 308 about the periphery of the basket may be replaced by a hook strip arrangement.

The central clamp may extend the entire length of the vibratory separator or may extend the length of each screen assembly.

The inventor has noted that a support structure for use in a screen assembly has to be very rigid and rigidly supported in a vibratory separator. In one aspect, the present invention attempts to provide an easily replaceable panel for a screen assembly of the pre-tensioned type or a partially pre-tensioned type, which is rigid and lightweight. A partially pre-tensioned type of screen assembly comprises one, two, three or more layers of screening mesh glued or otherwise attached to each other, and the layers are tensioned and are glued or otherwise attached to an apertured panel which is not rigid enough to provide a support when in use on its own in a shale shaker, but is strong enough to withstand the layers of screening material being tensioned thereover and attached to it. Bending of such a panel may occur under the tension of the layers of screening mesh, however, when the panel is placed over a support and locked in place, the layers of mesh are at a tension which is sufficient to be used in a shale shaker. It has been noted that by providing more support for the screen assembly, the frame can be lighter and retain sufficient rigidity. The frame can be made of less material, which

CLAIMS

1. An apparatus comprising a vibratory separator (300;800;1000) and a screen assembly (400;500;600;700;900), said vibratory separator
5 comprising a basket (301;808;1015), a side rail (305,306;801,802;1001,1002) for fixing at least a portion of a periphery (406,407;703,704;903,904) of said screen assembly (400;500;600;700;900) to said basket (301;808;1015), and means (311,509;614;803;1003) arranged
10 within said periphery (406,407;703,704;903,904) of said screen assembly (400;500;600;700;900) for fixing said screen assembly (400;500;600;700;900) to said basket (301;808;1015), wherein said screen assembly (400;500;600;700;900) comprises screening material
15 (404;508;610) and a rigid support (401,414;503;603), characterised in that said means (311,509;614;803;1003) deflects said screen assembly (400;500;600;700;900) upon fitting of said screen assembly (400;500;600;700;900) in said vibratory separator (300;800;1000).
- 20 2. An apparatus as claimed in Claim 1, wherein said screening material (404;508;610) is fixed to said rigid support (410,414;503;603) and wherein said rigid support (410,414;503;603) substantially prevents said screening material (404;508;610) from curling.
- 25 3. An apparatus as claimed in Claim 1 or 2, wherein said screening material (404;508;610) is tensioned over said rigid support (410,414;503;603) and wherein said rigid support (410,414;503;603) does not distort or bend under said tension.
- 30 4. An apparatus as claimed in Claim 1, 2 or 3, wherein said rigid support (410,414;503;603) inhibits or prevents said screen assembly (400;500;600;700;900) from bowing when said screen assembly is held at its periphery.
- 35 5. An apparatus as claimed in Claim 1, 2, 3 or 4, wherein said rigid support (410,414;503;603) inhibits

said side rails (811,812) comprising a clamping mechanism (815,816), such that in use upon activation of said clamping mechanism (815,816), said screen assembly (700) is deflected over said land, rail or anvil (804).

5 16. An apparatus as claimed in any preceding claim, wherein said means (314;509;617;1003) is movable in a vertical direction.

17. An apparatus as claimed in Claim 16, wherein said means (314;509;617;1003) is movable upwardly to move a
10 central part of said screen assembly (400,500,600,900) up.

18. An apparatus as claimed in Claim 16, wherein said means (616) is movable downwardly to move a central part of said screen assembly (600) up.

15 19. An apparatus as claimed in any preceding claim, wherein said screening material (404;508;610) comprises one, two, three or more layers of wire mesh.

20. An apparatus as claimed in any preceding claim, wherein said screening material (404;508;610) is attached
20 to said rigid support (410,414;503;603) by one or more of the following: hot glue, resin, sewing material, staples, welding and soldering.

21. A vibratory separator of the apparatus as claimed in any preceding claim, said vibratory separator having
25 means to deflect a screen assembly

22. A screen assembly for a vibratory separator, the screen assembly comprising a rigid support (401,414;503;603) and screening material (404;508;610), wherein said screen assembly has a periphery
30 (406,407;703,704;903,904) characterised in that said rigid support (401,414;503;603) further comprises a fitting (416;502;604;701;901) within said periphery (406,407;703,704;903,904) for receiving a means for deflecting said rigid support (401,414;503;603) in a
35 vibratory separator.

ABSTRACT

VIBRATORY SEPARATOR AND SCREEN ASSEMBLY

5 An apparatus comprising a vibratory separator (800)
and a screen assembly (700), said vibratory separator
comprising a basket (808), a side rail (801,802) for
fixing at least a portion of a periphery (703,704) of
said screen assembly (700) to said basket (808), and
means (803) arranged within said periphery (703,704) of
said screen assembly (700) for fixing said screen
10 assembly (700) to said basket (808), wherein said screen
assembly (700) comprises screening material and a rigid
support, characterised in that said means (803) deflects
said screen assembly (700) upon fitting of said screen
assembly (700) in said vibratory separator (800).

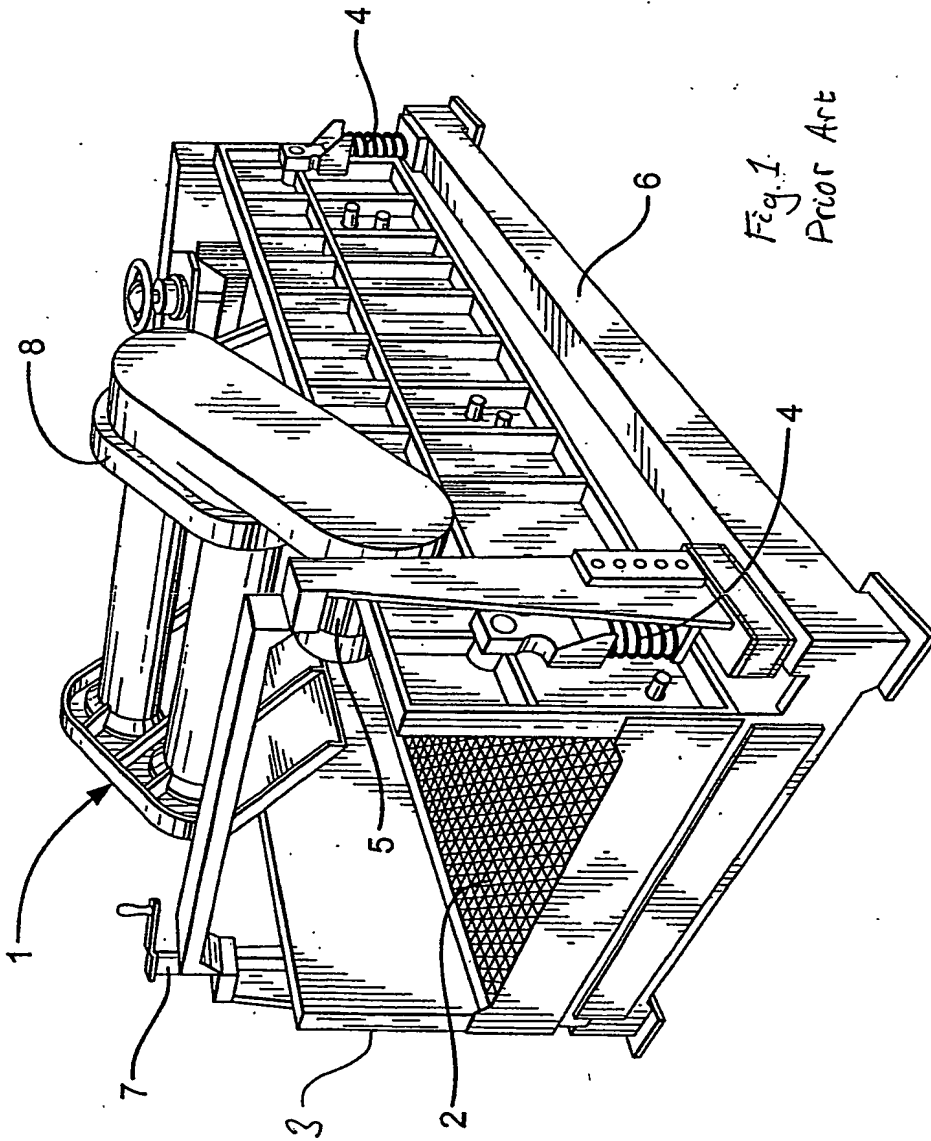


Fig. 1.
Prior Art

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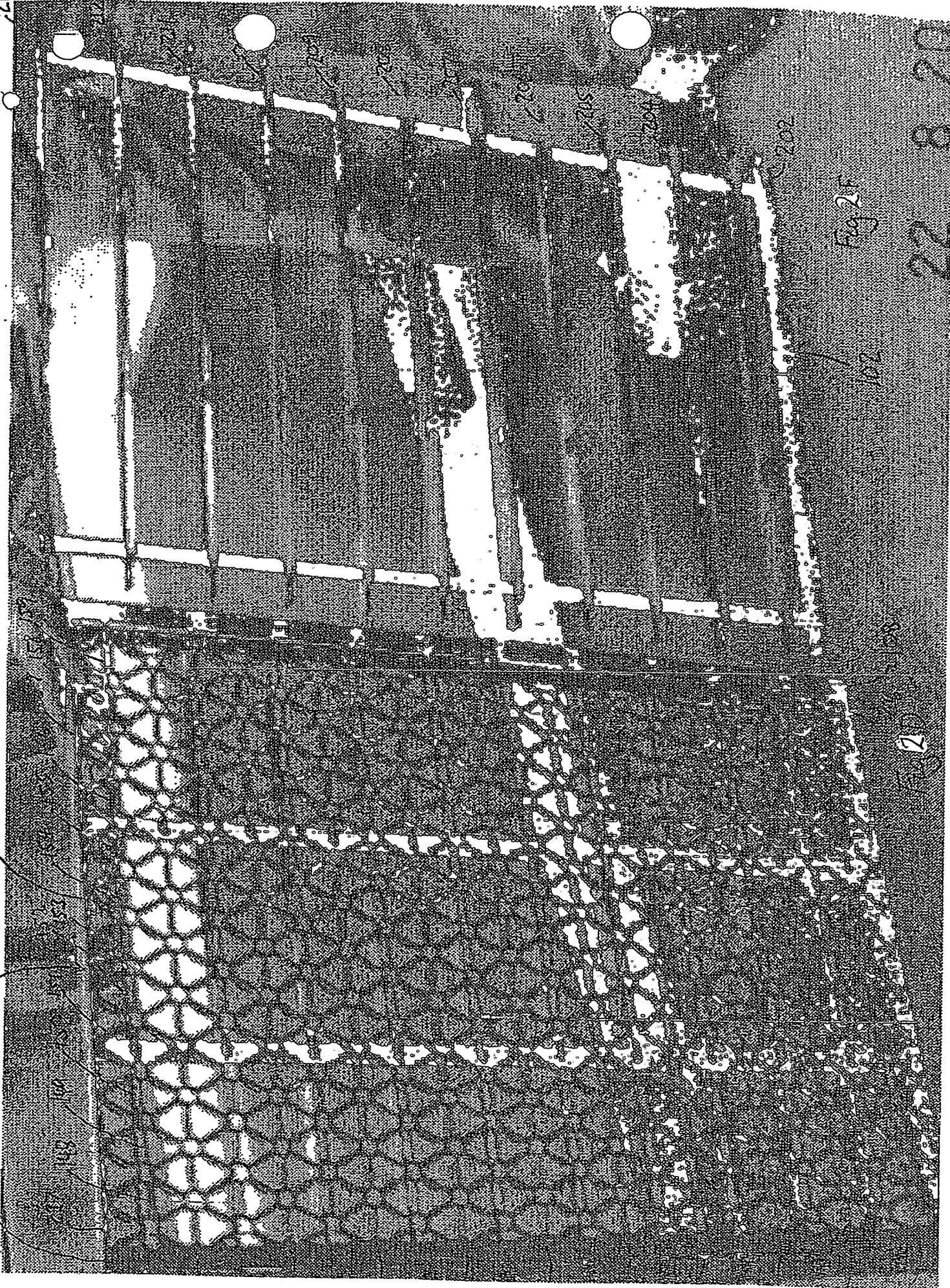
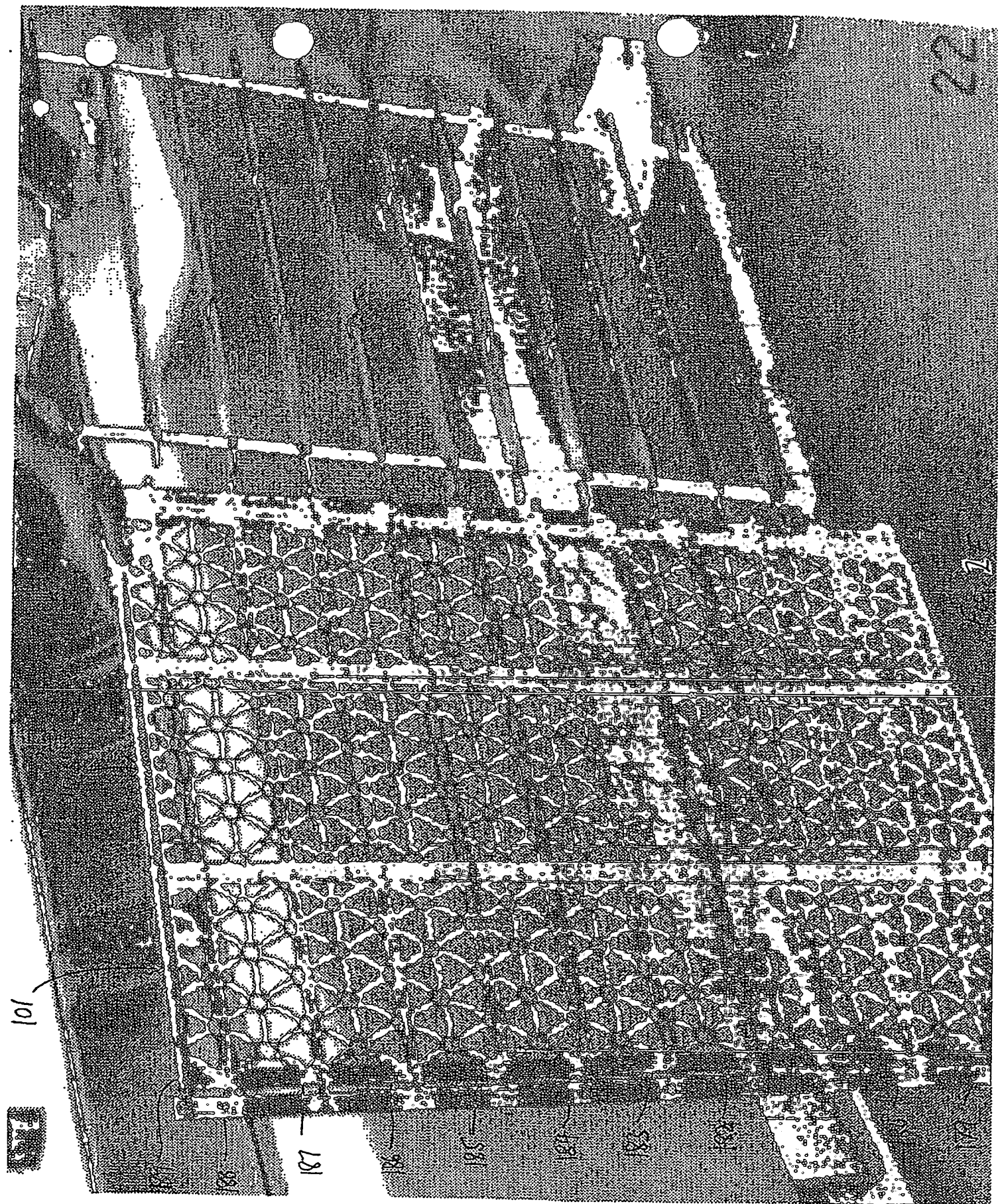
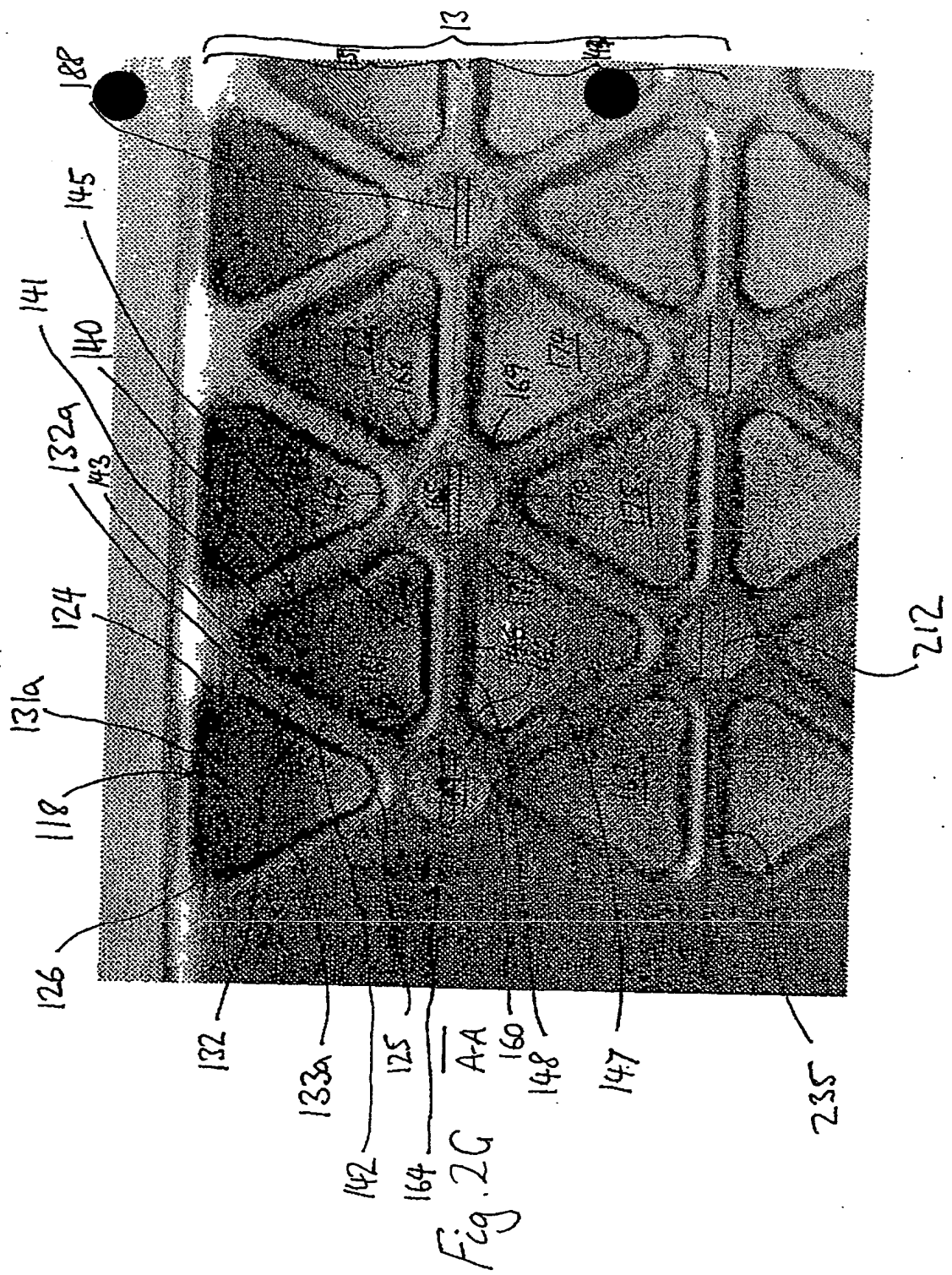


Fig. 21

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22 8 20





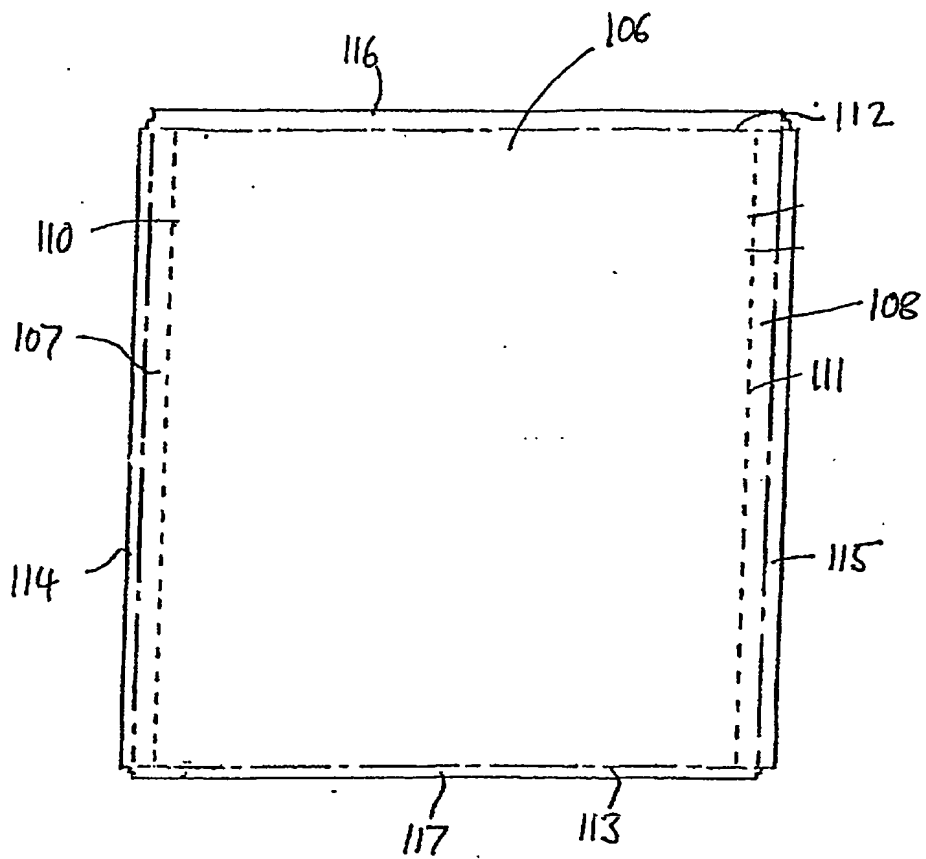


Fig. 2H

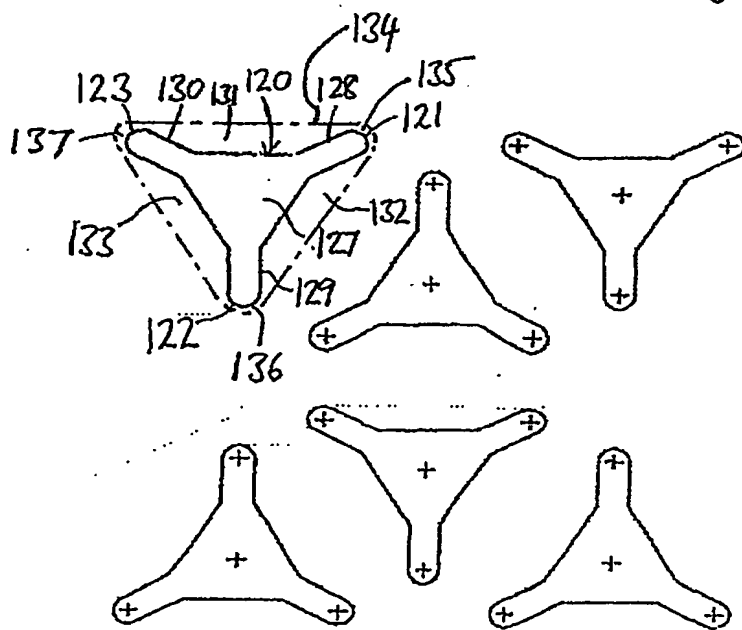
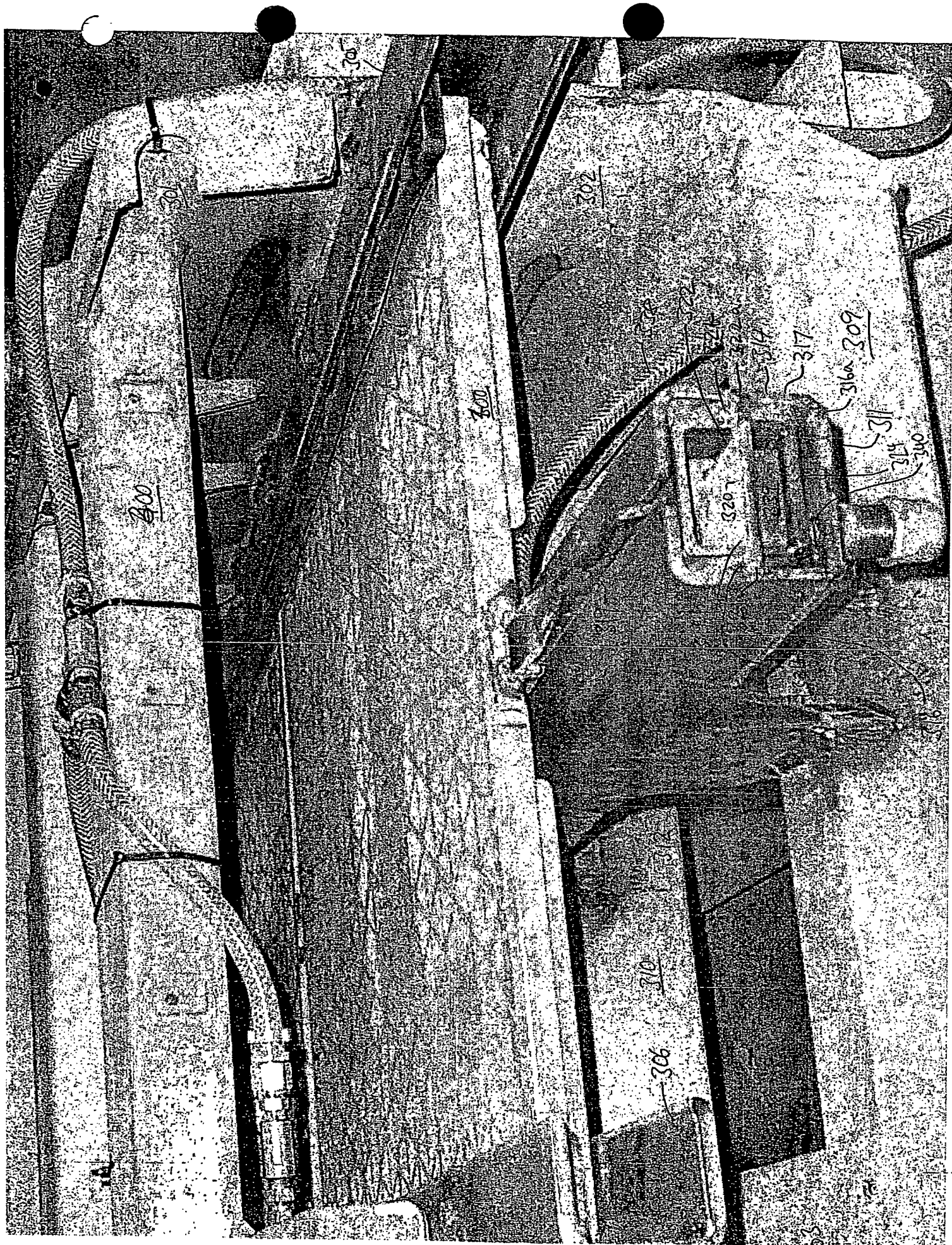


Fig. 2I



2.7

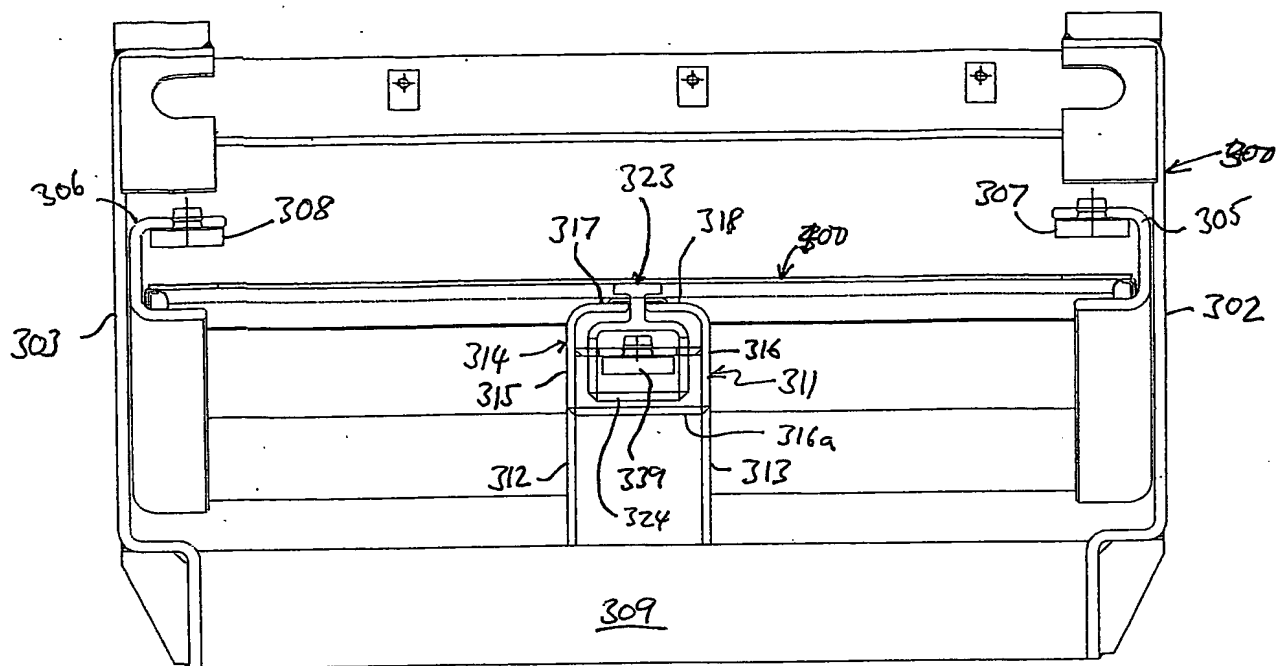
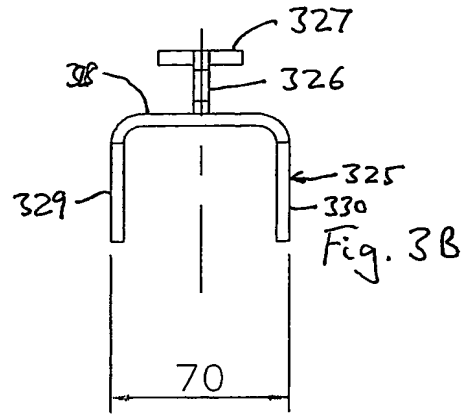
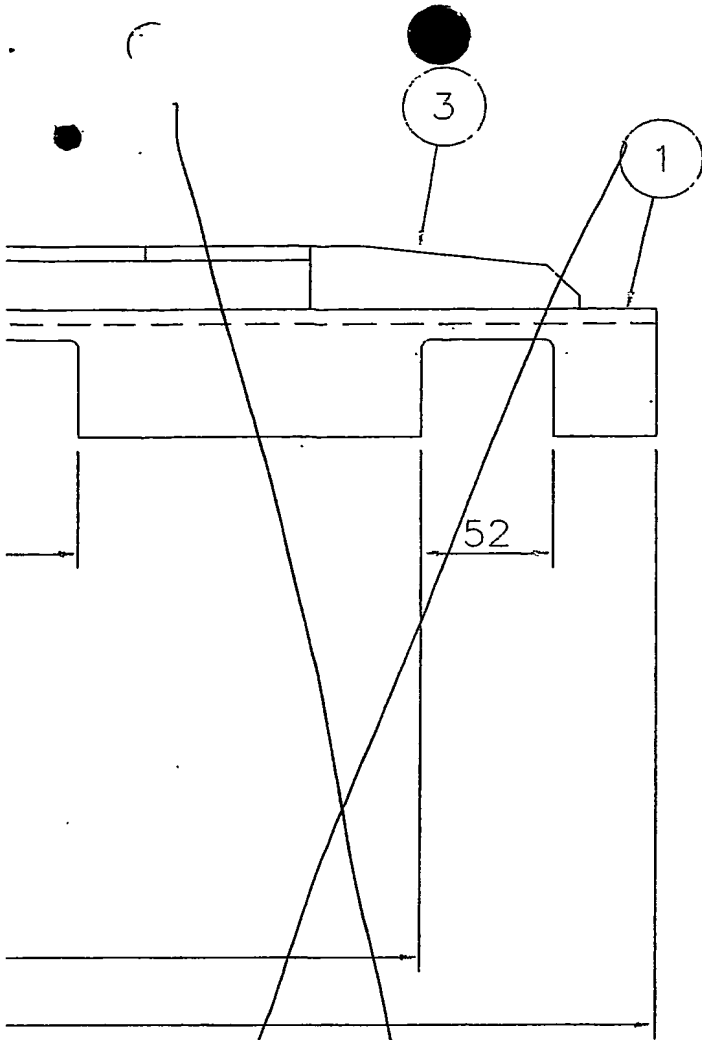
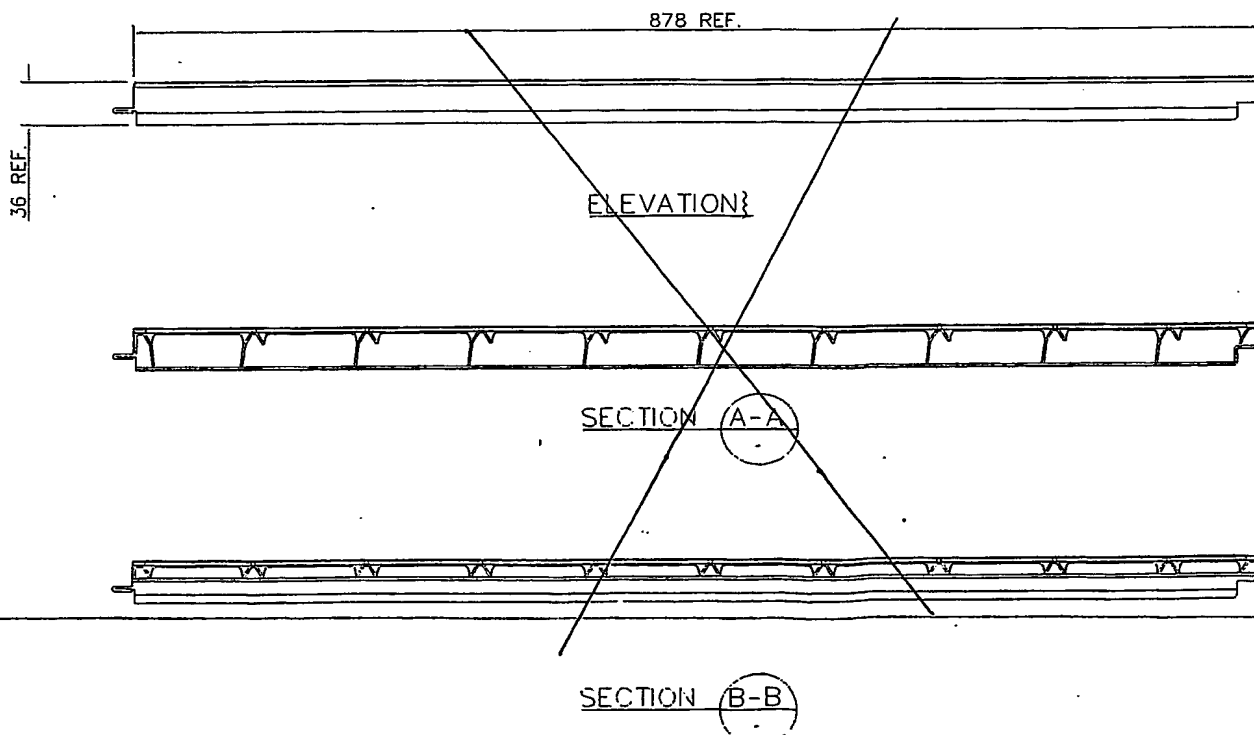
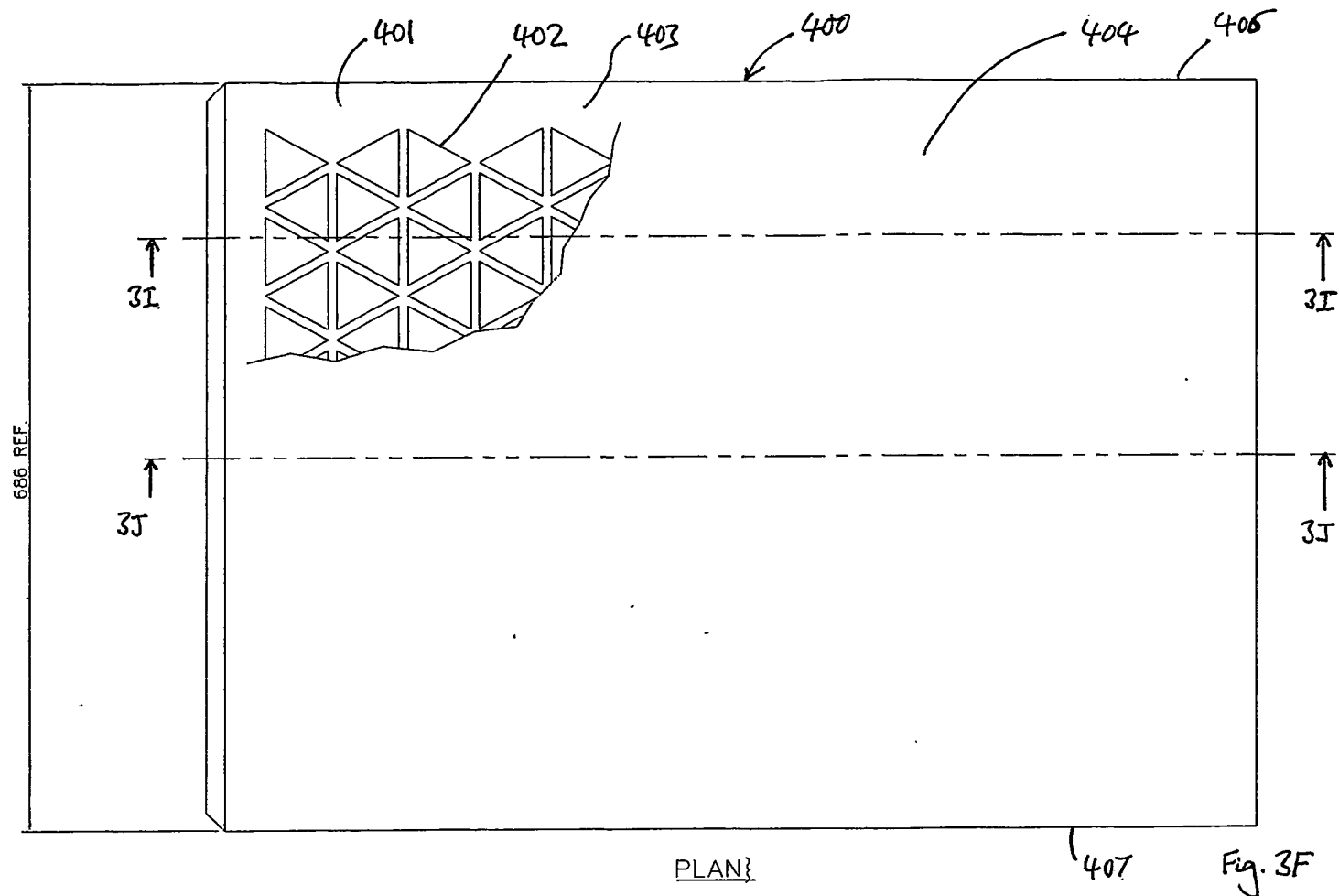


Fig. 3A



END ELEVATION}

ZEPHYR ROTOTYPE			TITLE. SCREEN CLAMP TEE SECTION DETAIL			
	1:3	DATE				
	N.S.	16.10.02				
Y			PRODUCT	DOCUMENT No.	SHEET	REV.
3Y				61782	003 OF	0



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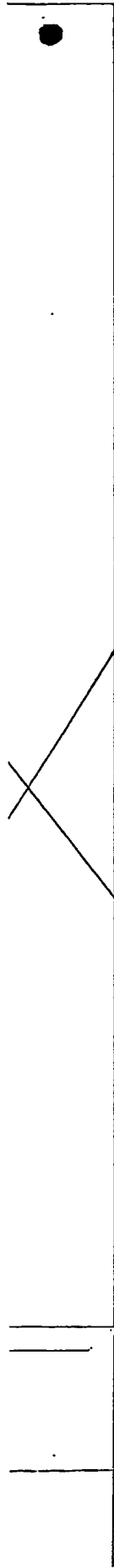
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878 REF.

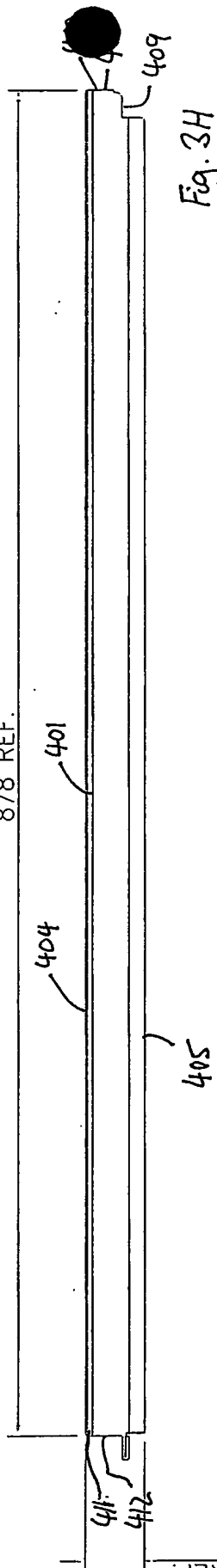


Fig. 3H

ELEVATION

879 REF.

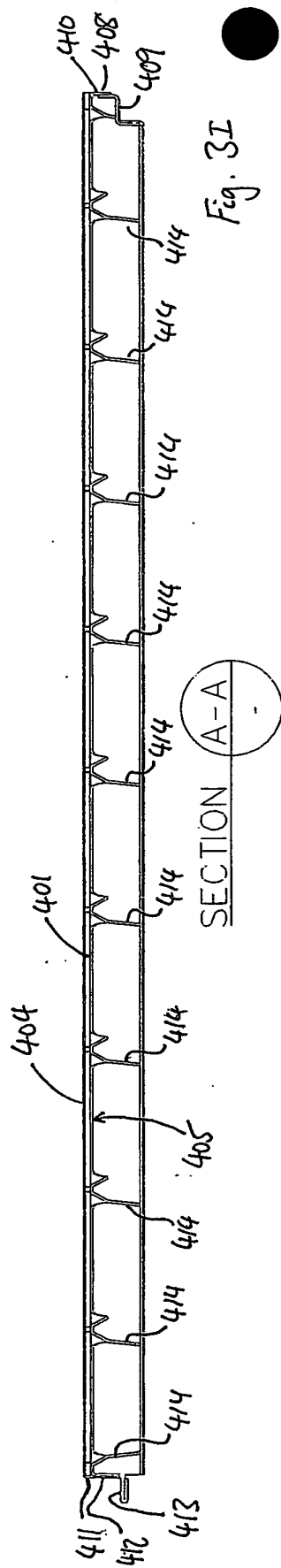


Fig. 3I

SECTION A-A

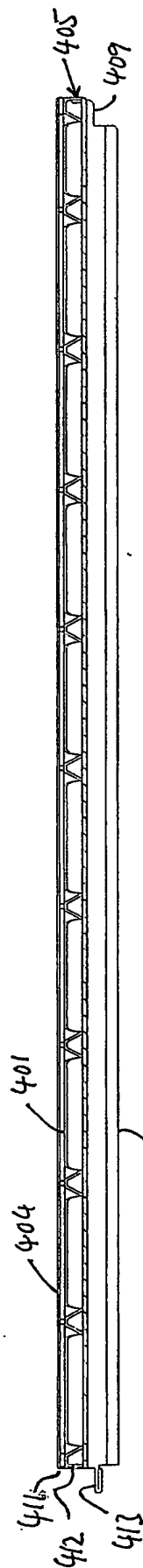
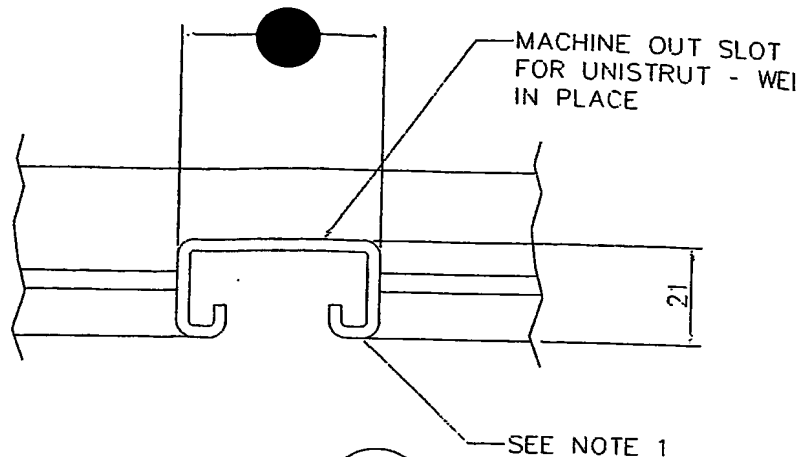
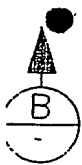


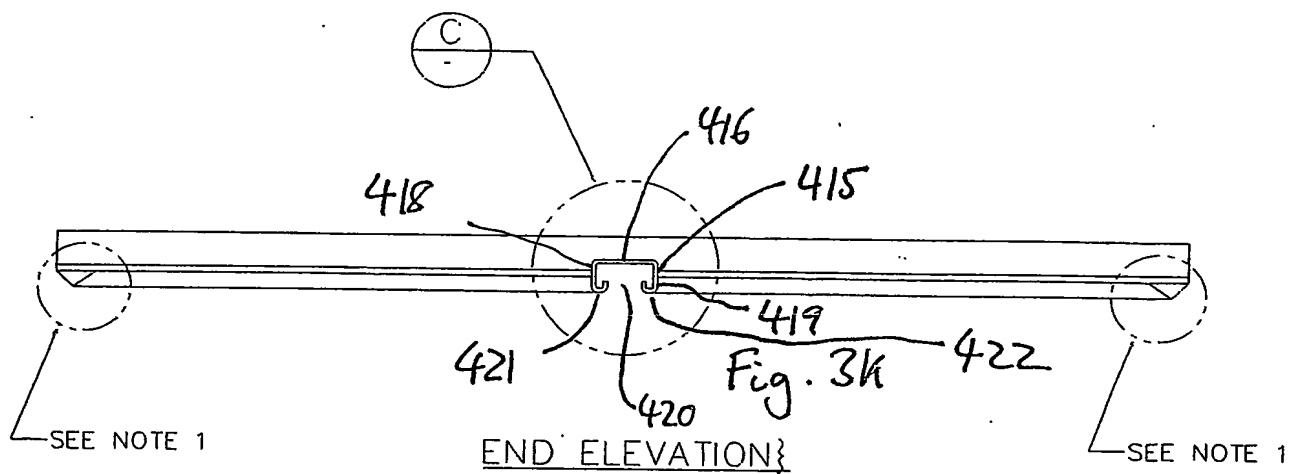
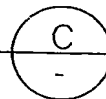
Fig. 3J

SECTION B-B



DETAIL

SCALE 1:1



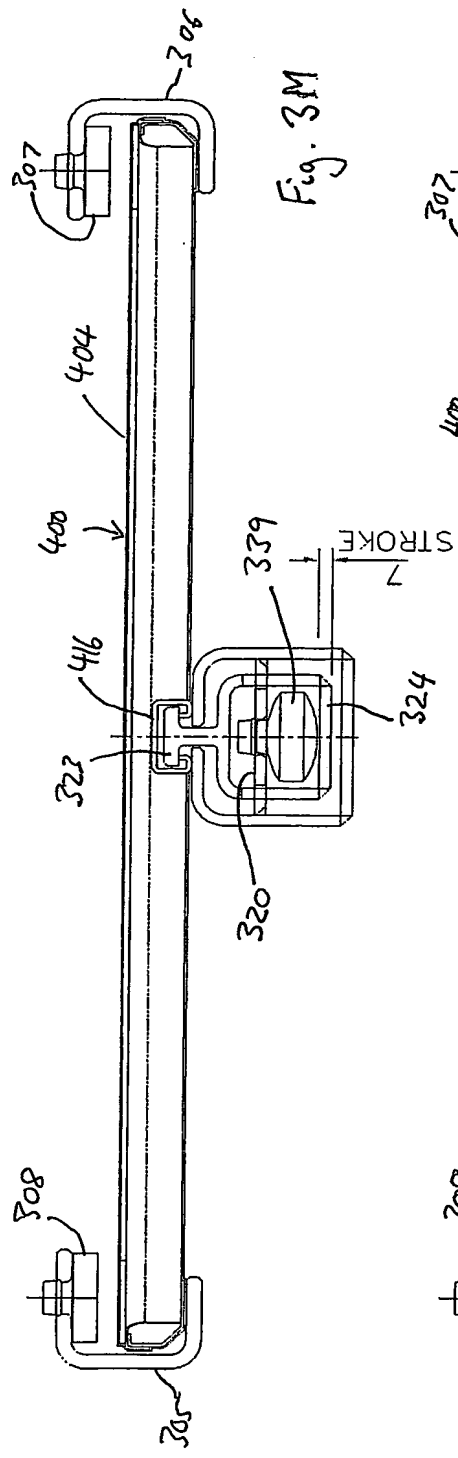
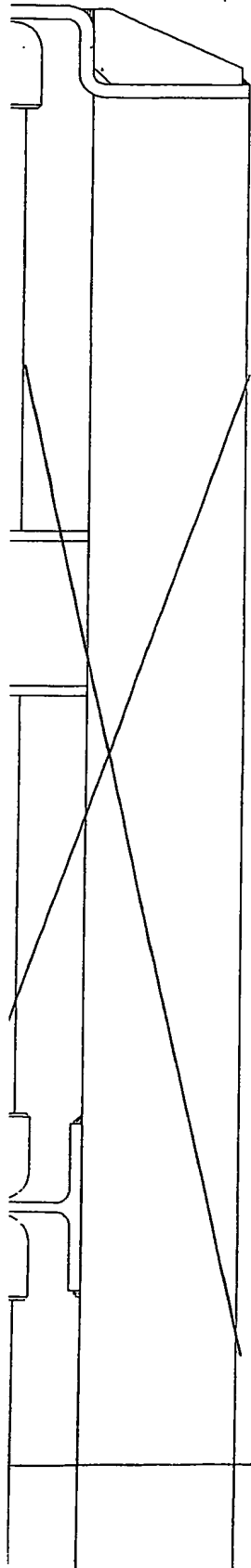


Fig. 3M

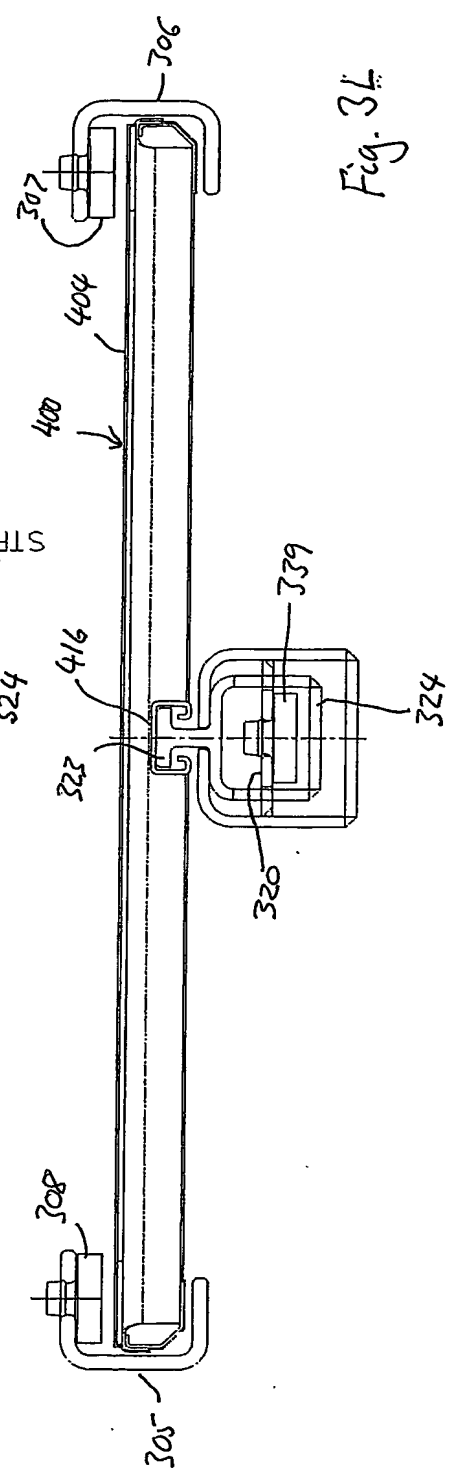


Fig. 3L

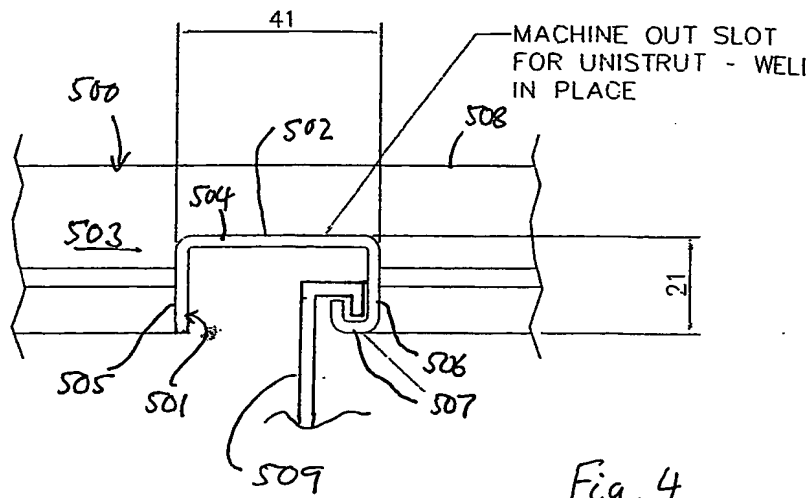
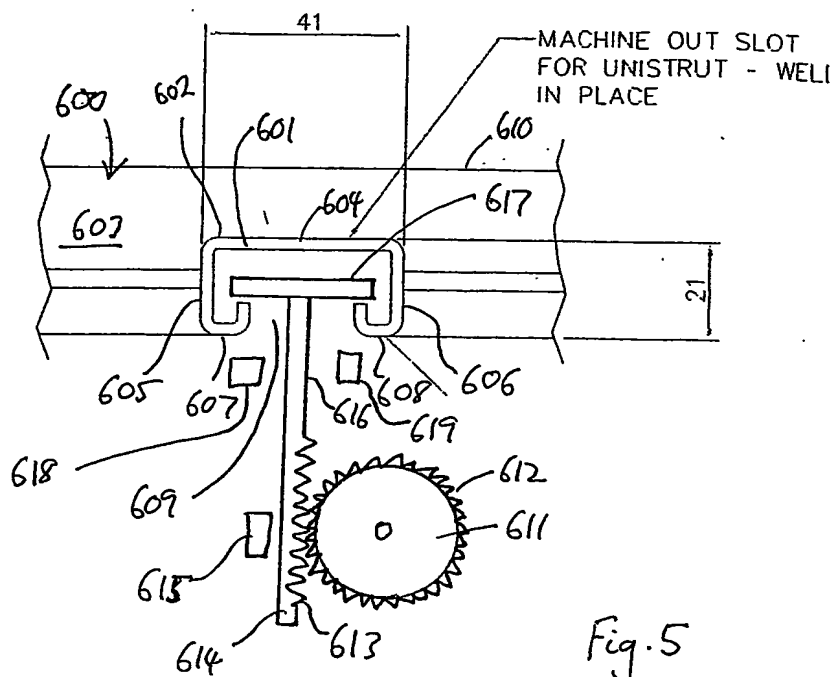


Fig. 4



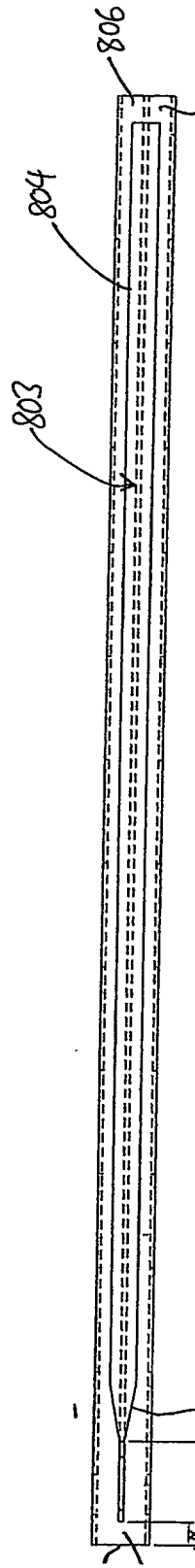


Fig. 6B

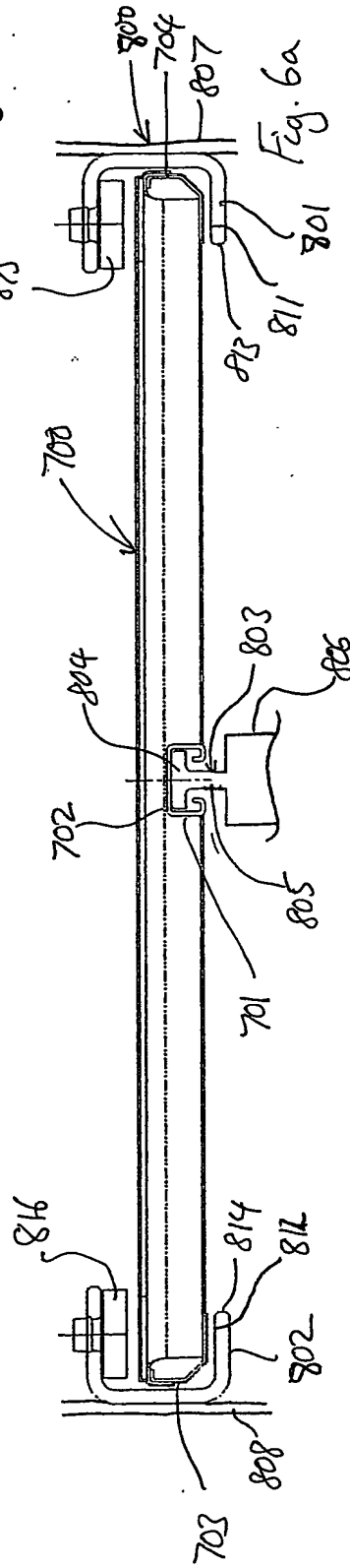


Fig. 6a

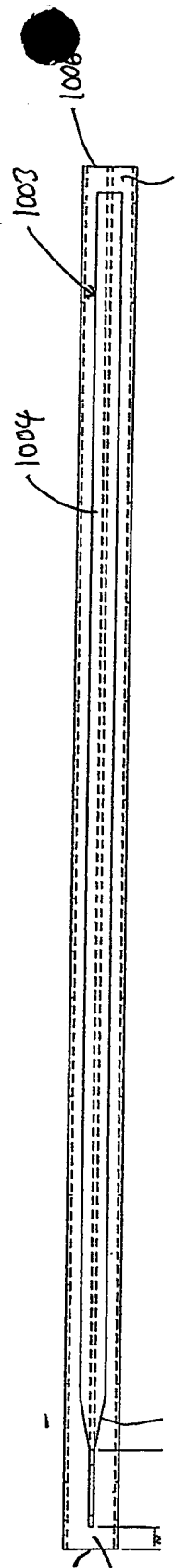


Fig. 7B

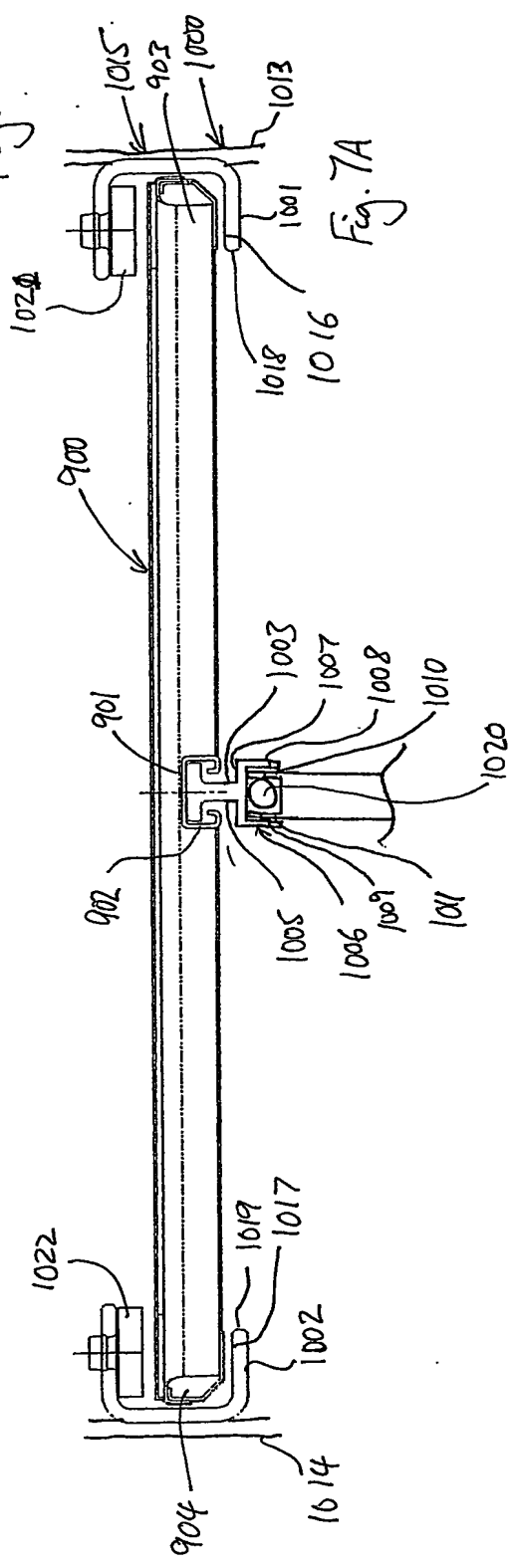


Fig. 7A



INVESTOR IN PEOPLE

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